Journal of Philippine Development
Number 50, Volume XXVII, No. 2, Second Semester 2000

Financing Rural Energy Services in the Philippines: Global Environment and People-Centered Development as Public Goods

HIKARI ISHIDO*

ABSTRACT

Access to energy is a means to achieve economic development. Both environmental concerns and the global privatization trends have fueled the worldwide need to develop new and renewable sources of energy such as solar, hydro, biomass, and wind. In the Philippines, where these new and renewable sources of energy abound but are not yet fully exploited, the national power development through grid extension has not reached most of the country's rural areas. One reason is the geographical characteristic of the country. Another is the fact that the Philippines' national policy framework for energy development has not been formulated in a manner that is consistent with the enhanced utilization of new and renewable sources of energy. This is a direct consequence of the insensitivity to this effective option, which makes both financial and environmental sense given its technical and economic merits. To this aid, a new financing scheme called Financing Energy Services for Small-scale End-users, or FINESSE, was established in the Philippines by the World Bank, United Nations Development Programme, and several bilateral aid agencies in 1991, and has been replicated in the country, specifically at the Development Bank of the Philippines.

* Programme Officer, United Nations Development Programme (UNDP). The author would like to acknowledge the helpful advice of Ms. Eufemia C. Mendoza (Vice President, Development Bank of the Philippines), Dr. Suresh Hurry (Chief, Energy Account/Energy and Atmosphere Programme/UNDP-New York) and Mr. Jorge Reyes (Sustainable Development Adviser, UNDP-Manila). The author also wishes to acknowledge the comments and suggestions from an anonymous referee. The views expressed in this study are those of the author and do not necessarily reflect those of the UNDP or the DBP.

INTRODUCTION

An improved standard of living is the aspiration of 70 percent of humanity living in developing countries around the world, and access to energy is an integral element to attain this goal (UNDP 1997). Energy in itself is not an end or a basic human need but it surely is a means to meet any of the basic human needs, i.e., food, shelter, health, education, and employment. It is estimated that two billion people worldwide live below the poverty line, and lack access to energy (Goldemberg and Johansson 1995).

Environment and energy were the central issues at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992.[1] It was pointed out in Agenda 21, which was adopted at the Conference, that current patterns of production and utilization of energy are not sustainable in terms of both power generation based on ever depleting fossil fuel, and the subsequent environmental degeneration. Agenda 21 identified two measures to address this situation: (1) pursuit of more efficient production, transmission and distribution, and end-use of energy; and (2) increased utilization of environmentally sound energy sources, notably NRE, such as hydro, solar, wind, and biomass.

The government of the Philippines has been making proactive efforts to tap new and renewable sources of energy to reduce the country's dependence on financially burdensome imported crude oil, which also has a detrimental impact on the local as well as global environment.

This paper discusses the potential of new and renewable sources of energy for power development in the Philippines, assesses the national policy framework in this field, and, finally, makes a theoretical as well as empirical analysis of a new financing scheme for power generation projects which utilize new and renewable sources of energy. Empirical evidence on NRE projects is still inadequate due to the fairly embryonic nature of technologies for this purpose. On this basis, the present research has the limitation of being hypothesis-oriented. The second section provides an overview of the energy situation and the relevant policy framework in the Philippines with an emphasis on the potential

[1] Recognizing the importance of addressing the issue of climate change, the Philippines adopted the UN Framework Convention for Climate Change (UNFCCC) in June 1992.

to accommodate new and renewable energy development. The third section discusses the economic characteristics of NRE projects. The fourth section refers to a new financing scheme for such NRE projects. The fifth section deals with the Philippines' recent experience in financing NRE projects. The sixth and final sections explore the future directions for the Philippines' rural electrification, and the Appendix gives a set of lending guidelines for financing NRE projects established in the Development Bank of the Philippines (DBP) in 1999.

OVERVIEW OF THE ENERGY SITUATION AND POLICY FRAMEWORK IN THE PHILIPPINES

Tables 1 and 2 combined seem to indicate that there is a strong positive correlation between the level of a country's per capita electricity consumption (as shown in Table 1) and the county's level of economic development (measured by per capita GDP, as shown in Table 2). The levels of the Philippines' per capita GDP and per capita electricity consumption in 1981 were comparable to those for Thailand, yet in 1998, there was a wide disparity between figures of these two countries.

Although these observations do not decisively indicate a causal relationship between the two measurements, such as the former being conducive to the latter as a consequence, it might be reasonable to state that access to electricity is one of the crucial factors when seriously pursuing the economic development of a country.

Developing countries all over the world have been facing a power crisis, albeit to varying degrees. Based on the current population growth and industrial expansion, electricity demand for the developing world is projected to grow at 7 percent per year over the first 20 years of the new millennium, as compared to 2 percent to 3 percent for industrialized countries (ASTAE, n.d.). In several Southeast Asian countries, demand growth exceeds 15 percent per year, while much of the developing world is planning to use environmentally detrimental coal thermal and large-scale hydropower to satisfy approximately 80 percent of its projected energy needs (ASTAE, n.d.). Rural electrification programs through national grid extensions, however, are both costly and problematic, not only in terms of the environment but also their

Table 1. Per capita consumption of electricity in selected Asian developing countries, 1981-1998

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Indonesia	65	79	96	114	127	140	99	114	134	155	172	188	206	232	262	296	249	320
Malaysia	776	797	853	899	960	995	1,050	1,136	1,225	1,422	1,527	1,674	1,820	1,994	2,253	2,134	2,363	...
Philippines	375	382	412	397	416	389	394	418	426	407	403	396	400	444	477	511	541	548
Thailand	353	373	412	449	482	508	569	633	595	687	767	910	1,005	1,120	1,251	1,351	1,427	1,382
Korea	915	963	1,068	1,164	1,243	1,366	1,542	1,768	1,936	2,202	2,410	2,634	2,890	3,283	3,620	3,998	1,952	...
Singapore	2,632	2,642	2,872	3,077	3,238	3,471	3,833	4,118	4,330	4,700	4,883	5,015	5,274	5,626	5,833	6,068	6,585	6,737
Taiwan	2,187	2,228	2,430	2,595	2,687	2,979	3,236	3,558	3,848	4,085	4,460	4,713	5,085	5,393	5,701	6,019	6,385	6,740

Table 2. Per capita GDP in selected Asian developing countries (US dollars/capita)

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Indonesia	608	611	540	542	530	475	441	506	566	638	701	748	835	920	1,038	1,147	1,068	483
Malaysia	1,770	1,847	2,038	2,203	1,990	1,722	1,912	2,048	2,180	2,409	2,595	3,063	3,281	3,606	4,220	4,684	4,517	3,202
Philippines	720	731	637	588	562	533	578	645	708	715	713	811	811	934	1,054	1,152	1,118	867
Thailand	730	751	806	826	754	821	946	1,135	1,309	1,529	1,737	1,945	2,159	2,459	2,831	3,024	2,540	1,904
Korea	1,801	1,893	2,062	2,537	2,311	2,636	3,275	4,330	5,233	5,893	6,817	7,194	7,822	9,017	10,848	11,423	10,381	6,913
Singapore	5,489	5,761	6,487	6,877	6,457	6,605	7,469	8,982	10,361	12,132	13,856	15,383	17,639	20,750	24,093	25,338	25,438	21,803
Taiwan	2,679	2,654	2,818	3,136	3,243	3,898	5,214	6,227	7,454	7,917	8,768	10,267	10,678	11,455	12,263	12,731	13,127	12,004

Source: ADB (1999)

low loading ratios and high transmission losses. The programs are typically highly subsidized, recovering only 50 percent to 80 percent of costs (Goldemberg and Johansson 1995; UNDP 1997).

These emerging realities are motivating leaders in the development community to seek new ways of providing the vital energy services needed to fuel economic and social development. The NRE comes into the picture at this point—in rural areas, it can play an important role in satisfying energy needs, while helping to mitigate environmental pressures.

Table 3 shows the energization status in the Philippines. According to the Table, there are about 10,000 unelectrified

Table 3. Philippines' energization status (as of December 31, 1999)

	Barangay level			Household level		
Region	Total target	Total achievement to date	Coverage (%)	Total target	Total achievement to date	Coverage (%)
Region I	3,034	2,956	97	572,000	502,130	88
Region II	2,384	1,844	77	444,000	322,725	73
Cordillera Administrative Region (CAR)	1,099	864	79	222,000	147,296	66
Region III	2,096	1,987	95	688,000	630,569	92
Region IV	3,513	2,742	78	758,000	550,367	73
Region V	3,408	2,463	72	693,000	453,586	65
Total Luzon	15,534	12,856	83	3,377,000	2,606,673	77
Region VI	3,869	2,892	75	907,000	512,630	57
Region VII	2,715	2,200	81	613,000	370,152	60
Region VIII	4,388	2,816	64	571,000	319,680	56
Total Visayas	10,972	7,908	72	2,091,000	1,202,462	58
Region IX	2,145	1,191	56	444,000	231,326	52
Region X	1,437	1,185	82	329,000	230,843	70
Region XI	1,568	1,019	65	614,000	337,355	55
Region XII	756	427	56	150,000	94,572	63
Autonomous Region in Muslim Mindanao (ARMM)	2,357	1,030	44	360,000	72,440	20
Caraga	1,306	994	76	321,000	237,790	74
Total Mindanao	9,569	5,846	61	2,218,000	1,204,326	54
Total serviced by Electric Cooperatives	36,075	26,610	74	7,686,000	5,013,461	65

Source: National Electrification Administration (n.d.)

barangays[2] in the country. The National Electrification Administration (NEA) has estimated that 6,483 *barangays* will be electrified by the year 2004, to achieve the goal of the Energy Resources for the Alleviation of Poverty (ERAP) program.[3] Of the 6,483 *barangays*, 4,488 can be connected to the grid, while the rest, or 1,995, can be electrified by utilizing NRE technologies, which are environment-friendly (DOE 1999). It should be noted that the figures at the household level are, in general, smaller than those at the barangay level, the reason being that some households are located in remote rural areas, thus providing a more realistic picture of the country's low electrification status.

After experiencing a major power crisis in the early 1990s and in line with the United Nations' Agenda 21, the government of the Philippines also adopted the Philippines Agenda 21, which identifies the need to develop and utilize NRE technologies as the country's priority development strategy (UNDP 1999). What this suggests is that there is a recognized need for rural electrification in the Philippines, although, as mentioned earlier, energy is not an end in itself but a means to attain people-centered economic development.

In spite of this general policy stance, however, the Philippines as a country of more than 7,000 islands may find it difficult to achieve total electrification, with the extent of electrification still a little less than 70 percent (UNDP 1999). The cost of bringing electricity to isolated rural areas remains prohibitive due, among other factors, to the low and dispersed demand for power and the high cost of interconnection to the main grids.

For the Philippines, with its population dispersed in the countryside, to enjoy higher economic development, it seems essential to implement efficient and sustainable energy systems,

[2] *Barangays* refer to the Philippines' smallest administrative units.

[3] Under the Estrada administration, the government launched the ERAP program to achieve improvement of people's livelihood in rural areas by providing adequate and sustainable energy services. This program aims to attain a 90 percent barangay-level electrification by the year 2004 and 100 percent by the year 2008, which is a dramatic increase from the present 72 percent electrification rate (DOE 1999).

particularly decentralized energy technologies. This is one of the major reasons why NRE sources are deemed suitable for rural and localized applications in the country.

Policy and institutional framework for the Philippines' national electrification

In response mainly to the serious power crisis which hit the country between 1988 and 1993 and brought down economic output by approximately 25 percent, the government of the Philippines introduced the Independent Power Program (IPP), which opened up the country's power sector to private development by restructuring the Department of Energy (DOE), deregulating the power generation sector, and providing policy incentives to attract private investment in the sector (DOE 1999). The government has also integrated the exploration, development and utilization of the NRE into the Philippine Energy Plan following the promulgation of Republic Act No. 7638. In 1993, the DOE launched the Renewable Energy Power Program (REPP)[4] through which a loan facility for funding IPPs using renewable energy sources was introduced (DOE 1999).

The Philippines possesses diversified indigenous energy resources, including coal, oil, natural gas, and a variety of NRE sources such as hydro, solar, wind, and biomass. From this perspective and in its quest for energy self-reliance, the policy effort has been put on its indigenous energy development programs and energy efficiency activities. The DOE is mandated to supervise, coordinate, and manage all plans and activities of the government in the development, exploration, and utilization of those energy resources. The DOE also supervises three key government agencies for energy program implementation—National Power Corporation (NPC), National Electrification Administration (NEA), and Philippine National Oil Company (PNOC)—each of which has an NRE thrust.

[4] The REPP purports to attain installed power generating capacities of 200 MW from biomass power plants, 150 MW from solar photovoltaic systems, 160 MW from wind turbine systems, and 5.15 MW from micro-hydro systems (UNDP 1997).

As for NRE project implementation in particular, the Non-Conventional Energy Division (NCED) of the DOE is responsible for formulating and implementing programs for the accelerated identification of NRE resources and the promotion of their application to power generation. The overall NRE policy targets include (1) the pursuit of large-scale use of NRE systems; (2) enhancement of energy self-sufficiency through continuous exploration, development, and exploitation of indigenous NRE resources; and (3) greater private sector investment in NRE activities. The national priority in NRE development is to promote off-grid NRE systems to achieve the goal of the ERAP program.[5]

The NPC, under the supervision of the DOE, is in charge of power generation and transmission, and has been under restructuring and privatization. The NPC's power development plan is geared toward the privatization of candidate islands that have a potential for commercial viability in the power generation business. IPPs are encouraged to participate in putting up generation facilities to address future increase in demands.

[5] The ERAP's NRE strategies include:

- Intensify research, development, and demonstration of techno-feasible and socio-environmentally acceptable NRE systems.
- Institutionalize area-based energy planning and management for NRE systems.
- Encourage a favorable market environment of manufacturers/suppliers and users of NRE systems.
- Intensify promotion of commercially viable NRE systems such as solar and wind.
- Continue adaptive research and development for less advanced technologies such as ocean thermal energy conversion, tidal, wave, fuel cells, and municipal solid wastes.

The overall NRE program at the DOE-NCED is to accelerate the development, promotion, and commercialization of NRE systems. The Affiliated Non-Conventional Energy Centers (ANECs) within the DOE take the lead in the department's promotion and commercialization of NRE at the regional and provincial levels. There are 20 strategically located ANECs based in all the regions to provide technical support and local presence of the DOE's NRE programs (DOE 1999).

The important point to make here is that although off-grid electrification through utilization of NRE seems to be the most effective technological option in view of its low cost nature (at least on a small scale) and absence of negative environmental impact, the NRE power development is not treated as high priority on NPC's energization scenarios[6]. In other words, although the NPC is seeking enhanced utilization of NRE power generators, they are not mainstreamed in energization for rural development.

[6] NPC has the following five scenarios for power development (NPC, n.d.):

(1) Shifting of operation mode from Diesel Generator sets (Gensets) to bunker-fired gensets In 2001 eight islands shall benefit for a reliable and efficient power supply by using bunker-fired gensets as base load units. Existing diesel gensets shall provide for ancillary services or reliability requirements. The program shall be taken by Build-Own-Operate (BOO) proponents to lessen the cash exposure of NPC. At the same time, the existing plants shall be offered to the winning BOO Proponents for rehabilitation, operation, and maintenance to limit the responsibilities of NPC to management and operation of its transmission lines. The program also considers the disengagement of NPC in the islands when the selling rates of NPC and IPPs are equal. This is speculated in the beginning of 2004.

(2) Further improvement of power service. Islands whose current demand exceed 500kW are candidates for conversion to B/C-fired gensets. It is projected that in 2002 another 15 islands shall benefit from this program. Existing plants shall provide the reliability requirements and shall be offered to the BOO proponents for their rehabilitation, operation, and maintenance.

(3) Failure of some of the islands under (1) and (2). In the event that this scenario happens, NPC shall install the required units through bilateral loans.

(4) Off-grid energization. The ERAP program requires at least 90 percent of the *barangays* to be provided with electricity in 2004 to alleviate the poverty level of the people in the rural areas. The options available are lending of gensets and installation of NRE facilities such as solar, wind/diesel or other hybrid configurations. These markets shall be opened to the private sector for bidding for rights to build and operate the systems.

(5) The NPC will handle the total electrification of all the islands that are not within the areas covered by the major grids—Luzon, Visayas, and Mindanao. In the event that this will be the scenario after the enactment of the Electricity Omnibus Bill, the NPC will be responsible for generation, transmission, and distribution.

This order of priorities reveals that although NRE projects are deemed applicable to rural areas, as in (4), they are not treated as the NPC's most favored projects for rural development.

Table 4. Island level energization plan for 2000-2005

Forecasted demand (kW)	Number of islands					
	2000	2001	2002	2003	2004	2005
Below 1,000	74	70	67	65	63	62
1,000 to 2,000	3	5	7	9	9	9
2,000 to 5,000	5	6	6	6	7	7
5,000 to 10,000	5	5	6	6	4	4
10,000 to 15,000	0	0	0	0	3	4
15,000 to 20,000	1	0	0	0	0	0
20,000 to 30,000	0	1	1	1	1	0
30,000 to 50,000	1	1	1	1	1	2
Total	89	88	88	88	88	88

Source: National Power Corporation (n.d.)

Considering that the Philippines' population is dispersed all over the countryside, and that projected power demands are small in size (Table 4), the more enhanced utilization of NRE technology seems to make economic and technological sense, as discussed below.

The NEA is tasked to promote NRE projects, while its primary mandate is rural electrification. It supervises and finances distributors—119 Rural Electric Cooperatives (RECs), 17 private utilities, and nine government-owned utilities (DOE 1999). As all areas in the Philippines are under the franchise of RECs, the private investors interested in setting up stand-alone NRE systems in one area need permission from the local REC, provided that the RECs do not have any plans to extend the grid to the said area in the foreseeable future.

Thus, under the national policy and institutional framework for power sector development, a number of NRE initiatives and programs have been carried out throughout the country for development, demonstration and small-scale use. It is noteworthy, however, that those initiatives and programs have operated on a highly subsidized pilot basis and have not been able to gain commercialization status in spite of the global economic trend toward privatization. Among the barriers to commercialization are lack of support to private suppliers, high cost of investment in the sector, low awareness, lack of technical expertise, and lack of access to financing (DOE 1999). In this light, there seems to be a need to review and redress the strategies on NRE utilization for power generation and redirect NRE in the mainstream of the Philippines' energy development policy.

Redressing the NRE policy and institutional framework

As depicted above, several government measures are in place to promote the NRE. The critical point to be stressed here is that the Philippines' existing national NRE policy framework lacks coherence. While each institution has its own NRE program, coherent coordination among different institutions in the baseline NRE institutional framework is lacking. Under the current policy framework, it is also difficult for the private sector to obtain permits from RECs to set up NRE projects in the areas that are under REC franchise (DOE 1999). Also, the current NRE policy framework has limited market orientation and limited financial incentives to encourage NRE development. In sum, the national NRE policies and programs in the Philippines have so far been mostly technology-driven rather than commercially-driven.

Because of these policy and institutional barriers, NRE projects have not been developed on a large scale in the Philippines in spite of their large potential for catalyzing rural development. It is in this context that the call for a coherent policy framework to enhance utilization of NRE technology has come into the development agenda of international aid agencies.

CHARACTERISTICS OF NRE PROJECTS

Overview of NRE technologies[7]

As can be seen in Table 5, new and renewable sources of energy have comparative advantages over fossil fuels and thus potentials for rural electrification in the Philippines, where NRE sources of energy abound. These NRE technologies offer a potential, particularly for the development of rural areas, since they match the needs of small-scale energy users and employ the skills, products, and services of the private sector, as discussed below. When bundled together, NRE projects ensure a more sustainable energy future. There are, however, disadvantages that NRE technologies face in their implementation.

One, the initial capital cost for the establishment of NRE power generation systems is generally high, which lends credence to the misconception that NRE projects are economically less competitive. In general, the adoption of a new technology or a new opportunity for productive economic activities takes time, and requires upfront investment cost, with the payoffs coming in at a later date. This point is illustrated in Figure 1. In the case of NRE projects, the distance between points A and D (gestation period) is longer than conventional projects and, correspondingly, the total investment costs become higher.

Two, credit market may not function smoothly, especially in the rural areas of developing countries. There seem to be two reasons for this. First, it is often very difficult to monitor exactly what is being done with a loan. It may be taken for a productive activity or it may be used for unproductive purposes without the knowledge of borrowers. Then the unproductive project cannot generate income for repayment, in a manner depicted in Figure 1. The second problem is voluntary or strategic default, a situation in which the borrowers can make the loan repayment in principle yet simply does not find it in their interest to do so. In any case, nonrepayment of loans inevitably has negative impacts on private financing institutions' lending behavior.

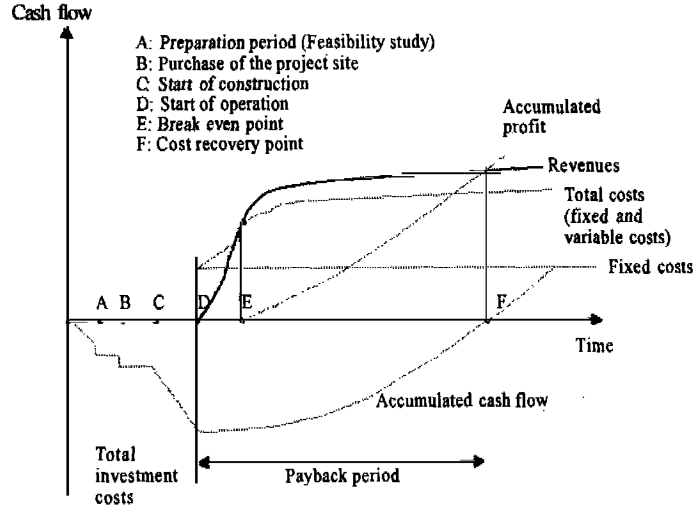
---

[7] This section is largely based on ASTAE (n.d.).

Table 5. Comparative advantages of new and renewable sources of energy

Source of energy	Comparative advantage
(1) Solar photovoltaic energy	Solar photovoltaic (PV) cells convert solar energy directly into electricity without any mechanical equipment and pollution. They have the advantage of modularity, with cells of varying sizes combining together to supply electricity from a few milliwatts to several megawatts.
(2) Solar thermal energy	Solar thermal systems convert the sun's energy into heat. In simple solar collectors, the low temperature energy collected on flat plates is used to heat water, dry grain, or even warm buildings. Higher temperature systems using parabolic troughs or parabolic dish solar collectors are used to generate steam for electricity or industrial heat applications.
(3) Hydro energy	In a hydro power plant, energy in flowing or falling water is converted into rotary motion, which is used to generate electricity or supply mechanical power. Hydro turbines range in size from several kilowatts to megawatts and come in a wide variety of designs. They are a common sight in almost all countries, while hydropower is the single largest use of NRE in the world.
(4) Wind energy	Turbines convert wind power into mechanical energy to generate electricity, pump water, or grind grain. Wind turbines are available in tens of watts to several hundreds of kilowatts, machines less than 50kW are usually used for of grid applications while larger machines are used for supplying electricity to the grid.
(5) Biomass energy	Biomass from energy plantations or as a waste product from agricultural, food processing, or timber operations, can be converted into useful forms of energy through combustion, gasification, pyrolysis, fermentation or anaerobic digestion. Biomass combustion can be used to produce either thermal energy for drying crops or steam for processing and electricity generation. Gases generated through gasification or digestion can be used for similar purposes. Liquid fuel produced through fermentation and pyrolysis can be used to replace petroleum-based fuels.

Sources: ASTAE (n.d.) and UNDP (1997a)



Sources: ASTAE (n.d.) and UNDP (1997a)

Figure 1. Cost and revenue projection of an investment project in general

Moreover, in case of uncertainty and limited liability on the part of borrowers, a conflict between lenders' and borrowers' benefits ensues.[8] Thus, uncertainty translates directly into "credit crunch" by institutional lenders. The main problem facing institutional lenders, particularly private banks, is that they often do not have site-specific knowledge regarding the characteristics and activities

[8] Following is a numerical illustration based on Ray (1998). Consider that loans are forthcoming at an interest rate of 10 percent and that there are alternative projects, each requiring an initial project cost of 100,000 pesos. Suppose that the projects are prioritized in terms of their financial rate of return and that there are two projects with financial rates of return fixed at 15 percent and 20 percent. Without uncertainty about the projects and assuming all of them pay off fully in the next period, we have a situation where the projects generate gross revenues of 115,000 and 120,000 pesos, respectively. This means that the borrower gets a net return of 15,000 and 20,000 pesos, respectively. The lender receives 10,000 pesos in either case. In this sense, there is no conflict of preferences between the bank and the borrower, as both parties are in favor of implementing the project with 20 percent financial rate of return.

Now suppose that the return to the first project is uncertain. Then, under the assumption that (1) the project pays off 230,000 pesos with probability 0.5 and nothing with probability 0.5 ; and that (2) both lender and borrower are risk neutral, then the borrower's expected net return on investment in this project is: 0.5*(230,000-110,000) + 0.5*0 = 60,000. The lender's expected return, on the other hand, is 0.5*10,000 + 0.5*0 = 5,000.

If the other project is without uncertainty, the borrower's expected return is 120,000 – 110,000 = 10,000. The lender's return, on the other hand, is 10,000. There is now a conflict of interests between the borrower and the lender. Based on profit maximization assumption, the borrower will opt for the "uncertain" project, whereas the lender will choose the "safe" project.

of their clientele. Oftentimes these agencies are not capable of monitoring how the disbursed loans are used. In this view and under the existence of uncertainties, commercial banks, which are primarily concerned with financial profitability, are not interested to cater to the needs of rural areas for development.

Three, there is a disparity between social and private benefits in the implementation of NRE projects. In the actual project evaluation, especially by private lenders whose primary objective is profit maximization, private benefits are used as the sole evaluation criterion. According to Fröhlich et al. (1994), the objective of financial evaluation is to determine whether an investment project will, under certain assumptions, render a return in monetary terms acceptable to the investors or developers and financiers.[9]

The objective of an economic evaluation, on the other hand, is to assess the overall impacts[10] of the project as the contribution of the relevant subsector to the regional, national or global economy. Although these impacts are difficult to quantify, the economic evaluation is a crucial part of project evaluation in the context of public policy formulation. This evaluation criterion, however, cannot be adopted by commercial lenders, since they cannot directly capture the social benefit in the form of private monetary return.[11] In this light, social benefits cannot induce private lenders to finance NRE projects.

[9] Such assumptions could, for instance, relate to the availability of workers, raw materials and technology and the prices and costs of project inputs. Cost projections and sales forecasts should be analyzed to determine how much they can deviate from projected values and what impact such deviations would have on the financial feasibility of the project. In cost benefit analysis, this is referred to as a "sensitivity analysis."

[10] These include environmental and sociological impacts.

[11] In this sense, NRE projects have the "public good nature."

On the other hand, NRE technologies have advantages which lend them well to the needs of energy users in remote areas for the following positive characteristics:

- *Low life-cycle costing.* As already mentioned, initial capital costs for the installation of NRE systems might be higher than those for fossil fuel-based power systems, yet the running or operating cost is marginal, thus making the "life cycle" cost over time competitive enough. Although NRE systems are yet to be fully provided commercially, and empirical data are still limited, Tables 6 and 7 show the recent evaluation of two off-grid renewable energy systems, wind, and PV for 41 households in the Inner Mongolia Autonomous Region of China, which have the operating experience of at least one year. This cost evaluation indicates that although fixed, or initial, costs for wind and photovoltaics (PVs) are higher than that for gasoline-based power generators (see the second row of Table 6), average costs of off-grid, house-scale wind and PV systems are cost competitive with conventional gasoline gensets (Table 7).

  In the Philippines, the Strategic Power Utilities Group (SPUG) of the NPC has been evaluating the potential fuel and cost savings that may be achieved by retrofitting existing diesel plants owned by SPUG with NRE technologies to develop a hybrid system.[12] A computer simulation by the National Renewable Energy Laboratory (NREL) of the Philippines, in cooperation with the SPUG, has proven the overall efficiency and effectiveness of diesel retrofit opportunities using the combination (hybrid) of wind and solar energy in the country (Sustainable Energy Solutions 1998).[13] Although these evidences are based on hypothetical assumptions instead of actual observations, they seem to indicate that the NRE provides an effective alternative to grid extension.

[12] A hybrid system includes any combination of wind turbine generators, photovoltaic modules, lead-acid batteries, an AC/DC power converter and existing diesel generators.
[13] Further modeling efforts to include other NRE technologies (such as biomass) are being made by SPUG and NREL.

Table 6. Selected assumptions and parameters used in the analysis of household systems

Parameters	Wind	Photovoltaics (PV)	Gasoline Gen-Set*
System types	100W – 300W	60Wp – 120Wp	450W-500W
System total capital cost ($/W)	1.70-2.78	7.39-7.55	1.10-1.57
Wind turbine or PV array as percent of total cost	43-61%	83-85%	-
Discount rate (percent)	12	12	12
Evaluation period (years)	10	10	10
Battery cost ($/kWh)	36	36	36
Battery lifetime (years)	3	4	5
Energy losses (percent)	32.5	32.5	32.5
Annual operation and maintenance cost ($/year)	2.5	2.5	18
Unit cost for delivered fuel ($/gallon)	-	-	3.07

Note: *Includes both cases of continuous serving and not serving duty equipment such as refrigerators and pumps.

Source: Adapted from Byrne et al. (1998).

Table 7. Costs for PV-, wind- and gasoline-power generation

	Wind	PV	Gasoline (Not serving continuous duty cycle equipment)	Gasoline (Serving continuous duty cycle equipment)
Output range (kWh/year)	200-640	120-240	660-730	480-560
Cost ($/kWh)	0.50-0.63	0.77-0.83	0.76-0.80	1.16-1.27

- *Modularity and tractability.* NRE systems can be sized to meet user needs. They require short lead times to build compared to grid-based energy systems, which require large-scale construction work.[14] NRE systems such as solar PV seem to be ideal for rural "pre-electrification", where only small amounts of power are used for basic services. In the case of the Philippines where population is dispersed in far-flung communities, solar PV can be pursued as the arrangement for ultimate-electrification.

[14] There are no standardized figures for lead-times required for the physical construction of NRE generation systems. Once institutional "barriers" associated with the establishment of NRE power systems are removed, however, the actual construction period is shorter than grid extension (ASTAE, n.d.).

In contrast, grid extension provides capacities in excess of initial needs, which also incur costs that tend to be higher as the distance of required grid extension goes up.[15] Also, NRE systems require considerably less maintenance costs (Table 6), than conventional systems such as diesel generators or grid-electric, and therefore they are better matched to the technical skills available in rural areas.

- *Reliability.* In the past decade, thousands of NRE systems have been successfully deployed worldwide under a wide range of operating conditions. Field tests of NRE systems demonstrate that the reliability of solar PV arrays are nearly 100 percent, wind turbines over 90 percent, and micro-hydro systems 85 percent to 90 percent (ASTAE n.d.). This reliability permits their use in the most demanding and isolated of conditions.

- *Utilization of abundant indigenous NRE potentials.* NRE systems use indigenous resources eliminating the need for fossil fuels. For example, biomass consumes waste products as fuel that would otherwise not be used productively. Solar energy is abundantly available in all areas as are wind resources.

- *Reduction of cost fluctuation.* NRE power generation systems do not rely on fossil fuels. This means that users are insulated from international price fluctuation and fuel supply disruptions.

- *Marketability.* With technological advancements, NRE applications are becoming more competitive in a growing number of markets. Solar PV systems provide least cost power for small rural villages more than a few kilometers from the grid. Where wind flows are

[15] In the case of grid-extension, there is a distance from the main grid at which the present life cycle per kilowatt hour (kWh) cost of grid extension is equal to that of local power generation (Sustainable Energy Solutions 1998). For example, a load density of 20,000 kWh/km can result in costs of US$0.10/kWh, but a load density of 700kWh/km can result in costs of US$1.00/kWh (Lovejoy 1992, as quoted in Sustainable Energy Solutions 1998).

continuously observed throughout the year, wind turbines provide competitive power for residential, agricultural, commercial, and industrial applications. Biomass energy systems are ideally suited for meeting agro-industrial needs while reducing wastes. Micro-hydro provides power for agro-processing, milling and heat generation. A further benefit is that the low fuel and operation and maintenance costs of NRE systems compensate for high capital costs resulting in competitive life cycle costs.

- *Developmental impacts.* NRE projects accrue to social benefit, in terms both of income generation and local as well as global environment.[16] And the social benefits of NRE projects significantly outweigh the social costs of energy production, if replicated on the global scale. Swezey and Wan (n.d.) points out that the prospective environmental clean-up costs of fossil fuel-based generation systems have been neglected upfront when such investment decisions are made. In other words, both negative externalities associated with the use of fossil fuel based-power generation systems, and positive externalities in relation to the use of NRE technologies, have not been captured in the energy market. In the face of increasing concerns for local and global environment, this distortion should be re-directed.

In this light, it could be concluded that if the above mentioned disadvantages could be mitigated, if not eliminated, the enhanced utilization of NRE technology in the power development could be an effective option in the Philippines where NRE resources abound.

[16] NRE projects directly translate into environmental benefits, both locally and globally. A unit of energy saved results in less air pollution by greenhouse gases (such as CO_2, SO_x, and NO_x) water pollution (by oil spills, coal mine runoff), acid rain, thermal waste, than a unit of energy provided by fossil fuel-based power generation.

Financing Energy Services for Small-Scale End-Users (FINESSE)[17]

FINESSE was launched in 1989 to develop innovative financial instruments for the commercialization of mature and market-ready alternative energy systems.[18] Since its launching, FINESSE has mobilized the growing interests of donor organizations and host countries alike in seeking new and better ways to provide energy services in the developing world.

FINESSE is founded on the belief that traditional energy sector lending—characterized by large-scale fossil fuel (such as oil and coal)-based power—will face economic, social and environmental barriers in the foreseeable future. This situation becomes most evident when the largely unmet, rapidly expanding energy requirements of rural households, cottage industries and enterprises are considered.

FINESSE challenges both the developing world to incorporate alternatives into national energy planning and policymaking, and the international financing community to lend needed capital and support for these projects. To aid in this challenge, FINESSE proposes replicable models for financing and institutionalizing alternative energy services. These models are based on channeling donor funds through a range of utility, private sector, non-governmental, and commercial lending intermediaries. FINESSE also outlines needed policy reforms for equitable consideration of alternative energy technologies.

FINESSE initiatives will contribute to positive national and global impacts on energy supply, industrial growth, employment, the environment, and revenues.

[17] This section is based on ASTAE (n.d.).

[18] FINESSE was sponsored by various multilateral as well as bilateral aid agencies, namely, World Bank, U.S. Department of Energy, Netherlands Ministry of Foreign Affairs, United Nations Development Programme, Asian Development Bank, U.S. Agency for International Development, U.S. Environmental Protection Agency, and Asian and Pacific Development Centre.

Strategies of FINESSE

FINESSE is a package of strategies for financing NRE projects in the developing world. Since new solutions to meeting energy needs are warranted, NRE technologies can play a major role in FINESSE. For the most part, however, decisionmakers and private developers have been reluctant to incorporate these technologies as a major component of their national energy programs due to the following factors:

- *Technology awareness.* There are misconceptions about alternative energy performance, applications, and cost competitiveness.
- *Financing.* Institutional lenders prefer large energy projects to economize on the associated administrative costs. The financing network does not effectively serve smaller borrowers whose individual projects tend to have high administrative and overhead costs.
- *Institutional arrangements.* There is a lack of adequate in-country institutional arrangements to identify, develop, finance, implement, and maintain NRE projects. In this relation, issues of policy dialogue, regulatory framework and capacity development should also be taken into consideration when the design of viable NRE projects are addressed.

To address these bottlenecks, FINESSE has the following strategies:

1. Through project bundling, NRE projects for residential and commercial applications can be packaged into singular project or subproject components to be of sufficient size to gain support from international lending agencies. This is also conducive to the lowering down of monitoring costs and also reduction of "moral hazard",[19] thus making the project financially attractive for both lenders and borrowers.
2. By incorporating these technologies into national planning, projects will be accorded the recognition needed to be considered a full-scale partner in a country's energy balance, and have the prominence to address trade and regulatory barriers.

[19] The term "moral hazard" in economics is referred to as opportunistic behaviors which intentionally take advantage of any form of insurance (intentional declaration of default on the part of borrowers, in this case).

3. Careful selection of appropriate institutions and staff who will develop and implement programs is a critical factor in securing a favorable outcome, thus avoiding the "credit crunch" situation.
4. Providing technical assistance and training at all levels in the project cycle, thus reducing the probability that the NRE project will fail.
5. In view of the global consensus that environmental conservation and poverty alleviation through rural electrification have positive social benefits on both national and international scales, NRE projects have access to concessional international funds.

One of the most effective FINESSE strategies at the implementation stage is what is referred to as utility strategy.[20] This strategy channels donor funds through host country utilities (RECs, as mentioned earlier) to deliver energy efficiency products in residential and commercial sectors, or renewable energy services for rural power needs (Figure 2). In this sense, FINESSE draws heavily on the participation of the private sector.

Utilities are a key player in the implementation of FINESSE schemes. The advantage of using the local utility is that it is charged with providing electricity, typically in the most cost-effective manner possible. Further, utilities have in place the financial and accounting systems to recoup payments for these services.

[20] There are three other strategies proposed to incorporate these elements and provide effective energy services to small-scale consumers. (1) Manufacturing strategy utilizes donor funds to help develop in-country assembly and production facilities for energy efficiency and renewable energy components and systems. In this case, local production and manufacturing of alternative energy products and services are key to market penetration. Through "upstream" manufacturing, products are made more accessible for "downstream" investments. (2) Franchise strategy utilizes intermediaries such as commercial banks or Foreign Direct Investments (FDIs) to provide private firms with donor funds for establishing franchise operations to sell or lease alternative energy equipment. In a franchise operation, a manufacturer will typically grant to a distributor or dealer the rights to sell the firm's products. Within the U.S. and other industrialized countries, franchising is one of the fastest growing forms of retailing. (3) Non-Government Organization (NGO) strategy works through cooperatives, credit unions, and other NGOs to on-lend donor funds for the marketing, distribution, financing, and maintenance of renewable energy systems in remote areas.

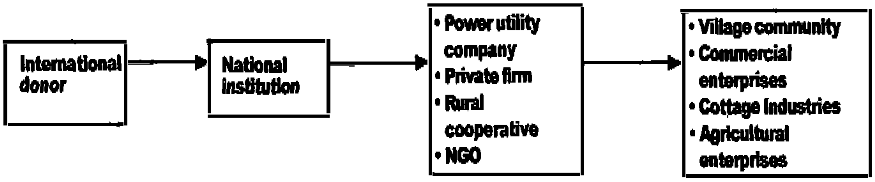


Figure 2. General financial scheme under FINESSE

In rural areas, donor funds could be used to establish mini-utilities powered by NRE as an alternative to grid extension. The utility would be responsible for installation, operation, and maintenance of the systems, as well as system billing and accounting.

Extensive use of the private sector is recommended to implement the utility strategy. For remote locations, local firms, as well as RECs, could be employed to provide energy services.

POTENTIALS OF DBP-FINESSE

Lending guidelines for NRE projects under DBP

Various FINESSE schemes have been used to deliver NRE services to rural areas worldwide (ASTAE n.d.).[21] These projects are directed

[21] There is an increasing number of successful NRE projects around the world. In the case of solar PV projects, they involve individual household units consisting of a small PV module, a controller, a battery, lights, and sometimes an outlet for TV or radio. Larger communities are served by PV hybrid systems where PV, together with diesels and wind turbines, supplies electricity to the village. The success of these programs is due to their delivery of valued service to the consumer, making the purchase affordable through a FINESSE-type financing mechanism, and establishing village-level sales and service centers responsive to customer needs. Two examples of solar PV projects follow.

Enersol, a non-profit corporation, introduced solar PV household systems to rural areas in the Dominican Republic. It set up a revolving fund for households unable to purchase the $500 system outright. A 25 percent down payment was required, with full payment made within two years at a 15 percent interest rate. A service center was established to sell PV systems and other short-term financing at commercial rates. Enersol has completed its 10,000th installation, and is negotiating funding from a number of sources to expand its activities.

Over 3,000 households in Sri Lanka use solar PV for operating lights, televisions, and radios through the efforts of Power and Sun Ltd., and BP Solar (Australia) Ltd. Small PV systems are either sold directly or leased to rural households, while an island-wide distributor network has been established. The operation is financed by the National Development Bank and the Development Finance Corporation. A major expansion program targeting 34,000 PV-based homes is envisaged to expand upon the leasing concept.

In the field of hydro energy, the Agricultural Development Bank of Nepal has successfully financed the purchase and installation of more than 650 small hydro turbines by individual farmers. The program began in 1974 when two workshops were set up to manufacture, sell and install these turbines. Since then, several more privately owned firms have begun producing and installing the turbines. Income earned by the farmers from milling operations and electricity sales is used to pay back the loans.

mainly at small-scale rural consumers, employing varying cost recovery methods, using differing institutional arrangements, and financed by a diverse range of sources. Projects have demonstrated that consumers value NRE products and are willing to pay for these services. They have also shown that designs exist to provide NRE services in ways that reduce the financial burden on donors, governments, and other key institutions. Replicating these successes on a national scale will make alternative energy technologies an integral component of a developing nation's energy balance.

In the Philippines, institutionalized efforts to finance NRE projects have just been initiated. One such effort is the establishment of lending guidelines for NRE projects under the Development Bank of the Philippines (DBP) in 1999.[22]

As the Philippines' prime financial institution for the country's economic development, the DBP is committed to promoting environment-friendly technologies and to generating more economic opportunities in the country by promoting NRE services for small-scale end-users and underserved populations. A principal barrier to the wider development and utilization of NREs for both on-grid and off-grid applications, however, has been the lack of innovative financing programs that recognize and exploit their unique characteristics. Following are the emerging concerns in the NRE project implementation:[23]

1. Most NRE undertakings require a longer project preparation period compared to conventional energy projects.
2. There is a lack of technical and project management expertise among prospective project proponents, i.e., local government units and rural electric cooperatives.

[22] DBP, through its Window III operations, has previous lending experience for solar (i.e., Belance and Burias Island) and mini-hydro (i.e., Lanao del Sur, Benguet, Davao, and Bicol).
[23] Comment from Ms. Eufemia Mendoza (Vice-President, DBP).

To address this situation, the DBP's board of management approved in November 1999 the establishment of New and Renewable Energy Financing Program (NREFP) for replication of FINESSE on the national scale.[24] The primary objective of NREFP is to provide financial support to project developers and end-users in line with the government's environment-friendly rural electrification and socioeconomic development program in areas where the generation of power, whether electric or mechanical, using these technologies, is proven as a viable alternative to conventional systems with negative environmental impacts.

DBP's NREFP takes on the following salient features:[25]

Interest rate is lower than commercial rates, and it may be fixed for the duration of the loan

- Loan terms are based on cash payback period of the project
- Relatively long grace period on the principal is allowable, depending on cash flow requirement of the project
- Collateral requirements are flexible, and DBP permits loan guarantees as collateral substitutes.

Fund sources for NREFP

Funding for NRE projects under NREFP can be sourced from the following Official Development Assistance (ODA) funds:

1. Environmental Infrastructure Support Credit Program (EISCP II), which is funded by the then Overseas Economic Cooperation Fund (OECF) of Japan (now Japan Bank for International Cooperation or JBIC)
2. Japan Export-Import Bank Facility for Private Sector Development (JEXIM IV), which is funded by the then Japan Export Import Bank (JEXIM, now Japan Bank for Interna-

[24] This is a technical assistance project which has been conducted since 1997 by the Energy Account/Energy and Atmosphere Programme/UNDP with bilateral ODA grant from the Dutch Government and the OPEC Fund for International Development. Enhancing DBP loan officers' capacity to evaluate NRE projects is one of the main objectives of the technical assistance.

[25] Up to 30 percent of the DBP's net income after taxes can be allocated for NRE projects under Window III, which is mandated to provide loans to various types of projects with high developmental impacts.

tional Cooperation or JBIC. The OECF and JEXIM have merged in 2000 to form the JBIC)

3. Industrial Pollution Control Loan Project (IPCLP), which is funded by the German government.

For projects/project components that cannot be accommodated under the above ODA funds, the amount of P200 million from the DBP's generated income has been allocated as Window-III Fund.[26]

Palawan Solar PV Project Under DBP-FINESSE

Palawan is among the provinces considered in the Rapid Rural Appraisal (RRA) conducted by the DOE in coordination with Palawan Associated Non-Conventional Energy Center and the rural electric cooperative in the area in line with the ERAP program.[27] It is also the country's second largest province, composed of 427 *barangays*, out of which 201, or 47 percent, are considered electrified. Most of the electrified *barangays* use a combination of mini-diesel grids and kerosene for their power requirements. The low level of electrification can be attributed to the large number of small islands (1,768) which constitute the province and the highly dispersed household populations in many of these islands.

Under the DBP's NREFP, a solar PV project in Palawan has been approved for financing (Table 8). The project is to install 400 solar PV energy systems in isolated households in Barangay Cabayugan and Barangay Bahile in the province. These households are not scheduled to receive grid-based electricity and have demonstrated willingness and the ability to pay for energy services. Many of these households expend considerable resources on kerosene for lighting and batteries or battery charging for other minor energy services. As a result of relatively high initial capital costs for individual households, the project attempts to develop a financing mechanism for delivery of solar PV systems to potential customers who may be able to afford the

[26] See Appendix for details of NREFP.

[27] This paragraph is based on Mendoza (2000).

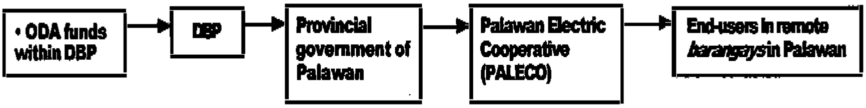


Figure 3. Institutional arrangement of the Palawan solar PV project

Table 8. Palawan Solar Photovoltaic Electrification Project

Loan proponent	Provincial government of Palawan
Loan amount	P10.655 million
Date approved by DBP	March 2000
Loan term	Ten years inclusive of a two-year grace period on principal
Interest rate	11.5 percent p.a. reviewable quarterly at AAA + 0.5 percent
Brief description	Loan of P10.655 million is intended to partially finance the installation of photovoltaic-solar home systems (PV-SHS) to provide the basic electricity needs of 400 households in Sitio Sabang in Barangay Cabayugan and Barangay Bahile in Puerto Princesa, Palawan. To lower the cost of the systems, the Department of Energy infused PhP 800,000 from its ERAP program.
Management scheme	The provincial government of Palawan will own the PV-SHSs while PALECO will carry out systems maintenance and will also be responsible for billing and collection.
Expected output	Electrification of 400 households in two *barangays* (Cabayugan and Bahile) in Northeastern Palawan

Source: DBP

amortization of the system. For this project, the following institutional arrangement is proposed: DBP finances the provincial government of Palawan (PGP), which entrusts the Palawan Electric Cooperative (PALECO) with the collection of connection fees and maintenance of the solar PV systems. In this sense, this institutional arrangement can be referred to as "service approach" in which a REC (not end-users) owns the power generation system (Figure 3).[28]

[28] It is well known in public economics that the "sales approach," where the power generation system is sold to and owned by end-users, could result in system abuse. This sort of over-utilization or abuse of public goods is generally loosely termed "moral hazard".

The PGP, which supports the installation of 400 PV-solar home systems in the two identified *barangays*, is the project proponent and owner of the systems. The operation and maintenance will be carried out by PALECO under a management contract and a service contract with the respective household heads. The PGP as the project proponent avails itself of DBP loan equivalent to 90 percent of the total project cost of solar PV systems[29] The DOE infuses a portion of its earmarked funds under the ERAP program as subsidy representing 7 percent of the total project cost while the households provide their equity of 3 percent.

PALECO is the franchise holder of the area for power distribution, and this arrangement seems to be advantageous since it has:

- Proven capability for billing and collection with a 99 percent efficiency rate
- The recognized authority to discount in case fees are unpaid or if the systems are abused
- Competent technical staff who can be trained in maintaining and repairing solar PV systems
- In-depth knowledge on local conditions

The household end-users are charged fees which fully cover the operation and maintenance costs of PALECO based on the system size.[30]

Apart from this Palawan solar PV project, the DBP has identified a number of pipeline projects which utilize solar PV and other NRE technologies such as hydro, wind and biomass, making logical the formulation of lending guidelines specific to NRE projects be among the priorities under DBP Window III's lending operation.

FINESSE began with the ambitious goal of trying to modify the way that energy planning and delivery are conducted in the developing world. Today, several countries are undertaking NRE projects under the FINESSE concept. Yet this is only the beginning.

---

[29] The total cost includes operation and maintenance costs such as training expenses.

[30] For a 36Wp solar PV system, P200 per month (US$5.0) is charged; for a 55Wp system, P350 (US$8.75) per month; and for a 75Wp system, P450 (US$11.25) per month.

Policymakers remain reluctant to alter the way they do business despite mounting economic and environmental pressures that dictate the need for change. For FINESSE to accomplish its mission, a collaborative partnership must be forged with each of the key stakeholders in the international community.

FUTURE DIRECTIONS

Based on the above, in sum, developing country governments, including the Philippines, should take a more aggressive stance to support NRE technologies and translate their commitment into national policy reforms and programs. Government efforts must support in-country energy, industry, and agricultural agencies to bolster their use of NRE technologies where they make economic sense. Multilateral and bilateral donors must routinely incorporate these technologies into project cycles and use their influence to reduce and eliminate policy and market distortions that hinder their use. In-country organizations in turn need to seize the opportunity and develop the requisite technical and administrative proficiency to channel donor funds toward the design, development, and implementation of FINESSE-type projects. Private NRE manufacturers and suppliers must look to local markets for joint venture, equity, and servicing partners to advance energy efficiency and renewable technologies into the economic and industrial mainstream of developing nations. Through the joint activities of these organizations, environmentally sound and sustainable energy options can be deployed, leading to enhanced industrial, economic, and social growth for the developing world.

The Philippines' national policy framework for energy development has not been formulated in a manner which is consistent with the enhanced utilization of new and renewable sources of energy, simply as a result of insensitivity to this effective option. Indeed, small-scale application of NRE to power generation makes both financial and environmental sense due to its economic and technical characteristics. In order for the rural electrification using NRE to gain momentum, privatization of electrification should also be vigorously pursued, since financial viability translates into sustainability and hence soundness of investment projects by private sectors. This in return would be conducive to additional private investments.

Under DBP-FINESSE, end-users have access to concessionary loans to avail themselves of power generation facilities utilizing new and renewable energy provided by private developers. What should be stressed here is that both global environment and people-centered development as "public goods" justify the use of grant/loan from the public sector in the form of ODA, since leaving the activity solely to the private sector would lead to the theoretical consequence called "undersupply of public goods." Led by this view, the notion of "sustainable development" has become one of the prime movers of the international development community. What is needed, therefore, is to mobilize ODA, not as "inordinate amount of subsidy" but as "leverage" by which to enhance private investment, specifically for rural electrification of developing countries, including the Philippines, in a sustainable or financially viable manner.

REFERENCES

ADB (Asian Development Bank). 1999. *Key Indicators of Developing Asian and Pacific Countries* (23). Oxford University Press.

AED (Alternative Energy Development). 1999. Financial Aspects of Renewable Energy Project Development and Implementation. Unpublished training material.

ASTAE (Asian Alternative Energy Unit). n.d. *FINESSE.* Washington, D.C.: ASTAE.

Byrne, J., B. Shen and W. Wallace. 1998. The Economics of Sustainable Energy for Rural Development: A Study of Renewable Energy in Rural China. In *Energy Policy* 26(1):45-54.

DOE (Department of Energy). 1999. Renewable Energy Framework in the Philippines. Draft document.

Fröhlich, E.A., P.M. Hawranek, C.F. Lettmayr and J.H. Pichler. 1994. *Manual for Small Industrial Businesses: Project Design and Appraisal.* Vienna: UNIDO.

Goldemberg, J. and B. Johansson, eds. 1995 *Energy as an Instrument for Socio-Economic Development.* New York: UNDP.

Lovejoy, D. 1992. Electrification of rural areas by solar PV. In *Natural Resources Forum* 16(2):102-110.

Mendoza, E. 2000. Experience in Financing Solar Home PV Systems in the Philippines. A paper presented at 16th European Photovoltaic Solar Energy Conference and Exhibition, May 1-5, 2000, Glasgow.

NPC (National Power Corporation, Philippines). n.d. *Power Development Master Plan (2000-2010).*

Ray, D. 1998. *Development Economics.* Princeton, New Jersey: Princeton University Press.

Sustainable Energy Solutions (in association with National Renewable Energy Laboratory and Strategic Power Utilities Group). 1998. *Analysis of Renewable Energy Retrofit Options to Existing Diesel Mini-Grids.* Asia-Pacific Economic Cooperation Energy Working Group.

Swezey, B.G. and Y. Wan. [online] 'The True Cost of Renewables: An Analytic Response to the Coal Industry's Attack on Renewable Energy' [cited 30 September 2000]. Available from the World Wide Web: (http://www.nrel.gov/analysis/emaa/pubs/ceed/ceed.html).

UNDP (United Nations Development Programme). 1997. *Energy after Rio: Prospects and Challenges.* New York: United Nations Publications.

————. 1999. "Project Summary" for Medium-sized Project-Request for Global Environment Facility Funds.

Appendix
New and Renewable Energy Financing Program
Lending Guidelines Approved by Development Bank of the Philippines

	Hydro (Installed capacities not exceeding 50 MW)	Solar	PV for telecoms	Wind Energy	Biomass
Objectives	To provide financial support to hydro project developers in line with government's rural electrification program in areas where the generation of electric power using the hydro scheme is proven to be a viable alternative to conventional power generation systems. To improve the quality of life of Filipinos, particularly the rural folk, by appropriately addressing their specific needs utilizing renewable and environment-friendly alternative sources.	To provide financial support to hydro project developers in line with government's rural electrification program in areas where the generation of electric power using the hydro scheme is proven to be a viable alternative to conventional power generation systems. To improve the quality of life of Filipinos, particularly the rural folk, by appropriately addressing their specific needs utilizing renewable and environment-friendly alternative sources.	To support the government's telecommunications program by providing financing to telecommunications companies in using photovoltaic or photovoltaic/hybrid systems in repeater stations and other remote applications.	To provide financial support to wind project developers in line with government's rural electrification program in areas where the generation of electric and mechanical power using wind energy is proven to be a viable alternative. To improve the quality of life of Filipinos, particularly the rural folk, by appropriately addressing their specific needs utilizing renewable and environment-friendly alternative sources.	To provide financial support to biomass project developers in line with the government's rural electrification program in areas where the generation of electrical power and/or thermal energy using various sustainable biomass resources in appropriate technology applications is proven to be a viable alternative to conventional energy production systems. To improve the quality of life of Filipinos, particularly the rural population, by appropriately addressing their specific energy needs utilizing renewable and environment-friendly alternative sources.
Fund sources	Applicable ODA Funds such as EISCP II, JEXIM IV, KFW-IPCLP, etc. DBP Funds for projects/project components which cannot be accommodated under existing ODA funds				

	Hydro (Installed capacities not exceeding 50 MW)	Solar	PV for telecoms	Wind Energy	Biomass
Elegibility requirements for borrowers	Eligible borrowers include duly registered entities authorized to undertake the project with at least 60 percent Filipino ownership with an exclusive or non-exclusive reconnaissance permit granted by the Department of Energy (DOE) such as but not limited to: ➢ Single proprietorships (registered with the DTI) ➢ Partnerships/ corporations/NGOs (registered with the SEC) ➢ Cooperatives (registered with NEA/CDA) ➢ Local government units (LGUs)	Eligible borrowers include duly registered entities authorized to undertake the project with at least 60 percent Filipino ownership such as but not limited to: ➢ Single proprietorships (registered with the DTI) ➢ Partnerships/ corporations/NGOs (registered with the SEC) ➢ Cooperatives (registered with NEA/CDA) ➢ Local government units (LGUs)	Eligible borrowers are corporations duly registered with the Securities and Exchange Commission with the necessary license from the National Telecommunications Commission.	Eligible borrowers include duly registered entities authorized to undertake the project with at least 60 percent Filipino ownership such as but not limited to: ➢ Single proprietorships (registered with the DTI) ➢ Partnerships/ corporations/NGOs (registered with the SEC) ➢ Cooperatives (registered with NEA/CDA) ➢ Local government units (LGUs)	Eligible borrowers include duly registered entities authorized to undertake the project with at least 60 percent Filipino ownership such as but not limited to: ➢ Single proprietorships (registered with the DTI) ➢ Partnerships/ corporations/NGOs (registered with the SEC) ➢ Cooperatives (registered with NEA/CDA) ➢ Local government units (LGUs)
Loan Purposes	Eligible borrowers may avail themselves of the loan to: ➢ Finance the construction of new hydro facilities, including pre-operational cost and expenses. ➢ Finance the rehabilitation, modernization, and expansion of existing hydro facilities to enhance its present level of viability.	Eligible borrowers may avail themselves of the loan to finance the acquisition of solar systems to be installed in residential, commercial and industrial and community-based facilities for the: ➢ Generation of electric power for lighting (stand alone or mini grid) and other applications, i.e. refrigeration and water pumping. ➢ Generation of thermal power for drying and water heating.	Eligible borrowers may avail themselves of the loan to: ➢ Finance the installation of PV or PV/hybrid power systems for new repeater stations and other ancillary facilities. ➢ Finance the rehabilitation, improvement, and expansion/retrofitting with PV or PV/hybrid power systems of existing repeater staions and other remote telecommunications facilities.	Eligible borrowers may avail themselves of the loan to finance the acquisition of wind generators (WTG) for power generation either on a stand-alone or grid-connected basis or windmills for water pumping, to be installed in sites with proven wind resource potential, backed up by at least one year of continuous and acceptable site monitoring data on ground level.	Eligible borrowers may avail themselves of the loan to: ➢ Finance the construction of new biomass facilities, including pre-operating expenses. ➢ Finance the rehabilitation, modernization, and expansion of existing biomass facilities.

	Hydro (Installed capacities not exceeding 50 MW)	Solar	PV for telecoms	Wind Energy	Biomass
Loan term	Allowable repayment term of the fund source.				
Grace period on principal	Maximum of three years for new projects and one year for rehabilitation/ modernization projects reckoned from the date of initial drawdown.	Maximum of two years reckoned from the date of initial drawdown.	Maximum of one year from the date of initial release of the loan for both new and retrofit projects.	Maximum of one year from the date of initial release of the loan.	Maximum of three years for new projects (depending on the technology applied and other relevant factors) and one year for rehabilitation/ modernization or expansion of existing facilities from the date of initial drawdown.
Interest rate	DBP Funds ➢ Prevailing Interest Rate with the gross receipt tax (GRT) for the account of the borrower. ODA Funds ➢ Applicable interest rate depending on fund source				
Application fee	An application fee of 1/2 of 1% of loan amount (minimum PhP500) will be charged to the borrower.				
Other fees	Depends on fund source for ODAs.				
Collateral requirements	The loan shall be fully secured by assets acquired out of the loan proceeds and other applicable securities specific to the projects such as but not limited to: 1. Real estate mortgage 2. Chattel mortgage 3. Loan guarantee (e.g. from GFSME, SBGFC, and other guaranteeing institutions acceptable to DBP) 4. Internal revenue allotment (IRA) for LGUs 5. Assignment of power purchased agreement 6. Assignment of insurance cover 7. Assignment of suppliers buy-back guarantee. 8. Joint and several signatures (JSS) of principal stockholders in case of corporation and key officers for cooperatives and NGOs.				
Equity	DBP shall finance up to a maximum of 75 percent of total project cost. The remaining 25 shall be the borrowers' equity. Depending on the total project cost, syndicated loans shall be considered.				